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Corn Seed Treatment

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Corn Seed Treatment

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The severity of corn seedling diseases varies from year to year depending on such factors as the soil moisture and temperature when the corn is planted, the disease resistance of the hybrid or variety grown, and the microflora of the seed and soil. As one means of combating these seedling diseases the treatment of corn seed has been recommended for some time in various sections of the United States, especially the Corn Belt.

In order to obtain more complete information regarding the value of corn seed treatment under southern conditions, experiments were conducted from 1944 to 1946 to determine the effect of various seed treatments on the stand and yield of corn hybrids. The experiments were made at the Rice Branch Experiment Station in Stuttgart, the Delta Substation of the Cotton Branch Experiment Station in Clarkedale, and the Main Experiment Station in Fayetteville. Also, tests were conducted in cooperation with the Southern Cooperative Corn Disease Research Committee in 1943 and 1945 to determine the effect of seed treatments on the stand of corn varieties produced in different sections of the South. The test in 1943 was made at the Substation in Clarkedale; the one in 1945, at the Main Station in Fayetteville.

METHODS

When more than one variety was tested the split-plot experimental design was employed using varieties for whole plot comparisons and seed treatments for split-plot comparisons. When only one variety was tested the randomized block layout was used. The corn was planted, unless otherwise specified, at the rate of one kernel every 20 inches, or about 7 pounds of shelled seed corn per acre. Individual plot size, which varied with the location involved, consisted of single 80-, 90-, or 100-foot rows planted 3 feet apart. Each treatment was replicated four times. The planting dates in general coincided with the average planting dates for the locality involved except at Fayetteville in 1946, when plantings were made at early, medium, and late dates.

[1] Formerly associate plant pathologist. Resigned Dec. 26, 1946.

In 1944 the test plots at Stuttgart were fertilized when the corn was about two feet high and the test plots at Clarkedale were fertilized before plowing. At Fayetteville in 1945 and 1946, fertilizer was applied to the plots before plowing and additional fertilizer was applied as a side-dressing when the corn was about two feet high.

The seed treatment rates were those recommended by the manufacturers of the various materials used.

RESULTS

The Cooperative Tests in 1943 and 1945

Only stand counts were taken in the tests conducted in cooperation with the Southern Cooperative Research Committee. In 1943 seed lots of corn produced in Mississippi, Oklahoma, and North Carolina were treated with Semesan Jr., Spergon, Arasan, Barbak-C, and Dubay 1451-D, and planted at Clarkedale. Stands were increased about 6 per cent by Arasan, Barbak-C, and Dubay 1451-D, as shown in table 1.

Table 1. Seedling Stands from Three Seed Lots of Corn Treated with Five Seed Treatments, Clarkedale, 1943

Note: All figures are average stands from four replications of 200 seeds each.

Seed treatment	Averages	Seed lots		
		Mississippi	Oklahoma	N. Carolina
		Stand count		
None	135.2	151.8	127.5	126.3
Arasan	144.8	158.5	123.5	152.5
Spergon	137.1	151.0	129.0	131.3
Semesan Jr.	131.9	135.8	132.5	127.5
Barbak-C	143.8	153.3	145.3	133.0
Dubay 1451-D	143.0	145.8	140.0	143.3

In 1945 when Oklahoma and Virginia seed lots were treated with the nine compounds shown in table 2 and grown at Fayetteville, significant increases in stand for the combined seed lots were obtained with Spergon, Arasan, and Dow 9B.

Results of the cooperative tests conducted in Arkansas and various other southern states from 1943 to 1945 indicate that corn seed treatment with certain compounds will increase seedling emergence five to ten per cent. The seed treatments were, in general, most beneficial in improving stands of seed lots of low germination.

Table 2. Seedling Stands from Two Seed Lots of Corn Treated with Nine Seed Treatments, Fayetteville, 1945

Note: All figures are average stands from four replications of 100 seeds each.

Seed treatment	Averages	Seed lots	
		Oklahoma	Virginia
	Stand count		
None	74.8	75.2	74.4
Arasan	81.9[1]	84.2[1]	79.6
Spergon	83.5[1]	84.8[1]	82.2[1]
Semesan Jr.	78.8	78.8	78.8
Barbak-C	78.1	81.6[1]	74.6
Dubay 1451-D	78.6	80.6	76.6
Dow 9B	79.0[1]	79.2	78.8
Phygon	78.7	82.4[1]	75.0
Dow 9A	76.4	77.4	75.4
Yellow Cuprocide	76.8	79.6	74.0

[1] Significant at 5% level.

The 1944 Tests

In 1944 tests were conducted at Stuttgart and Clarkedale on the effect of five seed treatments on the stand and emergence of Funk's G-706 and Corneli's Keystone 37 hybrids. Soil moisture and temperature at the time of planting were favorable for germination at both locations and nearly uniform stands were obtained with the nontreated and treated seed, as is shown in table

Table 3. Stand Counts and Yields from Two Corn Hybrids Treated with Five Seed Treatments, Stuttgart and Clarkedale, 1944

Note: All figures are averages of four replications. Seeds were planted one every 15 inches.

Seed treatment	Averages	Stuttgart		Clarkedale	
		Funk's G 706	Corneli's Keystone 37	Funk's G 706	Corneli's Keystone 37
		Stand count			
None	58.2	61.2	60.7	56.3	54.5
Arasan	58.7	60.5	61.2	57.5	55.5
Spergon	59.7	60.5	61.5	58.0	57.8
Semesan Jr.	59.1	58.7	60.5	59.3	58.0
Dubay 1451-D	58.4	58.7	59.2	59.0	56.5
Fermate	59.5	62.2	60.7	58.0	57.0
		Bushels per acre yield			
None	43.2	32.4	32.6	52.8	54.9
Arasan	45.4	33.7	36.5	51.3	60.1
Spergon	48.4	35.7	42.0	59.1	56.7
Semesan Jr.	46.5	37.6	35.2	55.9	57.5
Dubay 1451-D	44.2	36.5	32.6	52.3	55.4
Fermate	44.2	34.2	34.4	52.6	55.7

3. Differences in yields were not significant although the average yields were higher in all instances for the treated than for the nontreated seed.

The 1945 Tests

The results of the tests in 1945, conducted at Clarkedale and Fayetteville, are shown in table 4. Soil conditions at both locations were unfavorable for germination. At Clarkedale, signifi-

Table 4. Stand Counts and Yields of Funk's G 46 Hybrid Corn Treated with Five Seed Treatments, Clarkedale and Fayetteville, 1945

Note: All figures are averages of four replications.

Location	Seed treatment					
	None	Arasan	Spergon	Semesan Jr.	Dow 9B	Phygon
			Stand count			
Clarkedale	32.2	39.8[1]	38.8[1]	32.2	35.0	37.8[1]
Fayetteville	44.5	49.1[1]	49.7[1]	44.5	44.7	47.5
			Bushels per acre yield			
Clarkedale	30.3	39.4[1]	37.9[1]	34.6	38.3[1]	35.7
Fayetteville	55.5	68.1[1]	65.5[1]	54.4	57.1	62.5[1]

[1] Significant at 1% level.

cant increases in stands were obtained from seed treated with Arasan, Spergon, and Phygon, while significant increases in yields were obtained with the Arasan-, Spergon-, and Dow 9B-treated seed. At Fayetteville, significant increases in both stands and yields were obtained from seed treated with Arasan, Spergon, and Phygon. Arasan-treated seed gave the highest average yields at both locations.

The unfavorable soil conditions at planting time plus the good

Table 5. Stand Counts and Yields of Two Corn Hybrids Treated with Three Seed Treatments, Clarkedale, 1946

Note: All figures are averages of four replications.

Hybrid	Seed treatment			
	None	Arasan	Spergon	Semesan Jr.
		Stand count		
U.S. 13	36.2	38.7	41.0	39.2
Dortch 500	35.0	40.0	38.5	36.0
Average	35.6	39.3	39.7	37.6
		Bushels per acre yield		
U.S. 13	37.7	37.8	44.9	39.4
Dortch 500	33.7	35.8	42.3	30.7
Average	35.7	36.8	43.7	35.1

yields obtained as a result of fertilizer applications apparently magnified the benefits of seed treatments in 1945.

The 1946 Tests

The results of tests conducted at Clarkedale and Fayetteville in 1946 are shown in tables 5, 6, 7, and 8. As in 1945, soil conditions at both locations were unfavorable for germination. At

Table 6. Stand Counts and Yields of Four Corn Hybrids Treated with Five Seed Treatments, Planted at Fayetteville April 19, 1946

Note: All figures are averages of four replications.

Hybrid	Seed treatment			
	None	Arasan	Spergon	Semesan Jr.
	Stand count			
K2234	41.5	44.7	45.2	43.5
Mo.8	35.2	38.2	40.2	37.0
U.S. 13	43.0	43.7	45.2	44.7
Dortch 500	44.5	44.2	43.7	46.0
Average	41.1	42.8[1]	43.6[1]	42.8[1]
	Bushels per acre yield			
K2234	65.4	65.9	72.4	63.4
Mo.8	49.1	55.6	56.2	57.2
U.S. 13	52.7	62.0	62.1	59.8
Dortch 500	51.5	58.4	64.9	59.5
Average	54.7	60.5[2]	63.9[1]	60.0[2]

[1] Significant at 1% level.
[2] Significant at 5% level.

Table 7. Stand Counts and Yields of Four Corn Hybrids Treated with Five Seed Treatments, Planted at Fayetteville May 6, 1946

Note: All figures are averages of four replications.

Hybrid	Seed treatment			
	None	Arasan	Spergon	Semesan Jr.
	Stand count			
K2234	42.7	38.2	44.5	42.5
Mo.8	18.7	12.0	35.0	26.0
U.S. 13	40.0	33.7	42.2	40.7
Dortch 500	41.0	32.0	42.7	41.0
Average	35.6	29.0	41.1[1]	37.5
	Bushels per acre yield			
K2234	41.0	43.6	43.5	44.0
Mo.8	28.6	27.3	38.3	37.1
U.S. 13	40.8	37.0	45.7	44.3
Dortch 500	36.1	34.7	41.7	39.2
Average	36.7	35.7	42.3[2]	41.2[1]

[1] Significant at 5% level.
[2] Significant at 1% level.

Clarkedale small increases in stand were obtained with Spergon, Arasan, and Semesan Jr. Significant increases in yields were not obtained.

At Fayetteville, significant increases in stands and yields were obtained with Spergon, Arasan, and Semesan Jr. at the early date of planting; significant increases in stand were obtained with Spergon and in yields with Spergon and Semesan Jr. at the medium date of planting; and significant increases in stands but not in yields were obtained with Spergon and Arasan at the late date of planting.

Table 8. Stand Counts and Yields of Two Corn Hybrids Treated with Three Seed Treatments, Planted at Fayetteville May 21, 1946

Note: All figures are averages of four replications.

Hybrid	Seed treatment			
	None	Arasan	Spergon	Semesan Jr.
	Stand count			
Mo.8	37.7	47.2	51.0	42.0
U.S. 13	55.7	59.2	60.0	54.2
Average	46.7	53.2[1]	55.5[1]	48.1
	Bushels per acre yield			
Mo.8	29.5	30.7	31.5	33.6
U.S. 13	33.5	33.5	32.1	33.0
Average	31.5	32.1	31.8	33.3

[1] Significant at 1% level.

DISCUSSION

A summary of the results from 1944 to 1946 is given in table 9. The average yields in bushels per acre for all hybrids and at all locations were 41.3 for the nontreated seed, 47.7 for seed treated with Spergon, 45.4 for seed treated with Arasan, and 43.9 for seed treated with Semesan Jr.

As was pointed out at the beginning of this bulletin, the severity of seedling diseases of corn varies from year to year depending upon weather conditions and the amount of disease carried on seed corn. Because of these facts, seed treatments may be of great value in some cases and may show little benefit in others. Since it is impossible to predict whether or not seedling diseases of corn will cause serious losses in any particular year and since the cost of seed treatment is slight, amounting to only a few cents per acre, it is recommended that as a type of crop insurance seed corn be treated every year. As a measure of protection some corn seed producers are already treating their seed

Table 9. Summary of Stands and Yields of All Corn Hybrids Treated with Arasan, Spergon, and Semesan, Jr., Stuttgart, Clarkedale, and Fayetteville, 1944 to 1946

Note: All figures are averages of four replications for all hybrids tested.

Year and location	Seed treatment			
	None	Arasan	Spergon	Semesan Jr.
	Stand count			
1944—Stuttgart	60.9	60.8	61.0	59.6
Clarkedale	55.4	56.5	58.4	58.6
1945—Clarkedale	32.2	39.8	38.8	32.2
Fayetteville	44.5	49.1	49.7	44.5
1946—Clarkedale	35.6	39.3	39.7	37.6
Fayetteville[1]	41.1	42.8	43.6	42.8
Fayetteville[2]	35.6	29.0	41.1	37.5
Fayetteville[3]	46.7	48.1	55.5	53.2
Averages	44.0	45.6	48.5	45.4
	Bushels per acre yield			
1944—Stuttgart	32.5	35.1	38.8	36.4
Clarkedale	53.8	55.7	57.9	56.7
1945—Clarkedale	30.3	39.4	37.9	34.6
Fayetteville	55.5	68.1	65.5	54.4
1946—Clarkedale	35.7	36.8	43.7	35.1
Fayetteville[1]	54.7	60.5	63.9	60.0
Fayetteville[2]	36.7	35.5	42.3	41.2
Fayetteville[3]	31.5	32.1	31.8	33.3
Averages	41.3	45.4	47.7	43.9

[1] Seeded April 19.
[2] Seeded May 6.
[3] Seeded May 21.

before selling it to dealers or farmers. Such a practice by all producers of corn seed would be highly desirable.

Only one rate of dust application was used for the experiments reported in this paper. However, recent work done at the Oklahoma Agricultural Experiment Station,[2] when corn was treated with Arasan, Spergon, Semesan Jr., Dubay 1452-F, and Barbak-C at rates of 2.5, 2.0, 1.5, and 1.0 ounces per bushel of seed corn, showed no significant differences between the rates of application. It appears that a treatment rate of one ounce of chemical per bushel of corn will give satisfactory results.

The chemicals used in this report were applied to the seed in powder form. Recently the Semesan Division of the E. I. Du Pont de Nemours & Co. has perfected a method known as "the slurry method" in which the seed corn is treated with a water suspension of a special form of Arasan known as "Arasan S. F." The reports

[2] McLaughlin, J. H. Corn Seed Treatment in Oklahoma. Okla. Agr. Exp. Sta. Bul. B-294. 1946.

on this method of treatment appear promising from the standpoint of ease and accuracy of treatments.

SUMMARY

The results of corn seed treatment tests conducted from 1943 to 1946 at Stuttgart, Clarkedale, and Fayetteville, Arkansas, show that Spergon- and Arasan-treated hybrid seed corn gave 5 to 10 per cent better stands and yields than nontreated seed. Benefits from seed treatment were particularly outstanding when soil conditions at planting time were unfavorable for germination and optimum growth of the young seedlings. In 1946, significant increases in yields were obtained at Fayetteville with seed treatment at early and medium dates of seeding but not at a late date of seeding.